

THE HONORABLE THOMAS S. ZILLY

U.S. DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON

STRIKE 3 HOLDINGS, LLC, a Delaware
corporation,

Plaintiff,

vs.

JOHN DOE, subscriber assigned IP
address 73.225.38.130,

Defendant.

JOHN DOE subscriber assigned IP
address 73.225.38.130,

Counterclaimant,

vs.

STRIKE 3 HOLDINGS, LLC,

Counterdefendant.

NO. 2:17-cv-01731-TSZ

**DECLARATION OF ERIC FRUITS IN
SUPPORT OF DEFENDANT'S
OPPOSITION TO PLAINTIFF'S
MOTION FOR SUMMARY
JUDGMENT**

1 I, Eric Fruits, hereby declare under the penalty of perjury under the laws of the United
2 States of America, the following:

3 1. I have been asked to testify as an expert witness on the analysis of economic
4 aspects of BitTorrent litigation.

5 2. Summary of my opinions. First, the statements made by Mr. Lansky in his *Ex-*
6 *Parte* Motion (Ex 4-2) are not supported by the evidence. The sole purpose of this litigation is
7 not to curtail infringement, as there are numerous and more cost-effective ways to do so, rather
8 the evidence indicates this litigation was created to produce an additional revenue stream
9 (copyright monetization). Second, based on census data from the zip code which the subscriber
10 resides, the plaintiff had a roughly 36% chance of correctly naming the subscriber as the alleged
11 infringer.

12 3. I have a Ph.D. in Economics and have testified on numerous cases. My resume is
13 attached as Exhibit 1. I charge \$350.00 per hour for my services.

14 4. I am familiar with BitTorrent litigation. I served as an economics expert in the
15 case of *Malibu Media, LLC v. Doe subscriber assigned IP address 76.126.99.126* in the Northern
16 District of California. I served as an economics expert in the case of *Clear Skies v. Hancock* in
17 the Northern District of Illinois. I served as an economics expert in the case of *QOTD v. Wilson*
18 in the Western District of Washington. My expert report has not been excluded in any of these
19 BitTorrent cases.

20 5. My declaration concerns the following docket entries in this case:

- 21 a. Entries 1,1-1 – The Complaint and Exhibit
 - 22 b. Entries 4,4-1 to 4-5 – The Ex Parte Motion
 - 23 c. Entries 41, 41 -1 – The Kennedy Declaration
 - 24 d. Entries 42-1 – Cox Declaration
 - 25 e. Entries 43, 43-1 – The First Amended Complaint and Exhibit
 - 26 f. Entry 70 – Lansky Declaration
- 27

g. Entries 73 – Kennedy Declaration

6. My opinions in this declaration may be amended as more information is provided by the Plaintiff.

7. I will testify at oral argument at a hearing for this motion if that is required.

8. Greg Lansky made a declaration under a penalty of perjury at Docket 4-3. Greg Lansky states he has "...personal knowledge of all matters contained in this declaration...". I note that at Docket 70, Lansky made a different declaration about his knowledge. For the purposes of this motion, I will assume Docket 4-2 is accurate and not contradicted by Docket 70.

9. Relevant parts of the Lansky Declaration (4-2) state:

a. "Unfortunately, piracy is a major threat to our company. We can compete in the industry, but we cannot compete when our content is stolen. (§22)

b. "We have discovered that when we put videos online for paid members to view, it takes as little as four minutes to be downloaded on to torrent websites. We have attempted to identify the initial seeder but have found it impossible with the large volume of our subscriber base. (§23)

c. "We send on average 50,000 DMCA notices a month but it does virtually nothing to stop the rampant copyright infringement". (§26)

d. "The only effective way to stop piracy of our movies on BitTorrent is to file lawsuits like this one." (§27).

10. Citing *In re Charter Commc'ns, Subpoena Enforcement Matter*, 393 F.3d at 773 (8th Cir. 2005), the court in *BMG Rights Mgmt. (US) LLC v. Cox Commc'ns, Inc.* (E.D. Va., 2016) notes:

Congress enacted the Digital Millennium Copyright Act ("DMCA"), which sought to strike a balance "between the interests of ISPs in avoiding liability for infringing use of their services and the interest of copyright owners in protecting their intellectual property and minimizing online piracy." In return for a certain amount of

cooperation, ISPs would enjoy the protection of four liability-limiting safe harbors. To be eligible, an ISP must, for example, “adopt[] and reasonably implement[], and inform[] subscribers and account holders of the service provider’s system or network of, a policy that provides for the termination in appropriate circumstances of subscribers and account holders of the service provider’s system or network who are repeat infringers.” [footnotes and citations omitted]

11. From an economics approach, the idea to “strike a balance” recognizes that the purpose of copyright enforcement under the DMCA is to discourage infringement while reducing the costs associated with litigation.

12. At the time of the downloading activity alleged by Plaintiff, Defendant’s Internet service provider, Comcast, indicates it had policies to comply with the DMCA:¹

Owners of copyrighted works who believe that their rights under U.S. copyright law have been infringed may take advantage of certain provisions of the Digital Millennium Copyright Act of 1998 (the “DMCA”) to report alleged infringements to us. In accordance with the DMCA and other applicable laws, Comcast also maintains a policy to terminate the Service, in appropriate circumstances, provided to any customer or user who is a repeat infringer of third party copyright rights.

13. I understand that Plaintiff has not provided any information demonstrating that Strike 3 notified Comcast of Defendant’s alleged activity outside of the present litigation.

14. The Lansky Declaration claims filing lawsuits against individual alleged downloaders is “the only effective way to stop” infringing downloading of its copyrighted material. Docket 4-3, ¶27.

15. Strike 3 has filed 2,754 complaints in federal court alleging copyright infringement. Filing fees alone amount to more than \$1.1 million.

16. Since the date of the Lansky Declaration, Strike 3 has filed 2,637 complaints alleging copyright infringement. In the first two months of 2019, Strike 3 has filed more than 360 complaints. If the volume of complaints filed by Strike 3 are an indication of actual

¹ Comcast Corporation. Acceptable use policy for XFINITY® Internet. October 11, 2017. <https://web.archive.org/web/20171011050118/www.xfinity.com/Corporate/Customers/Policies/HighSpeedInternetAUP.html>, retrieved February 22, 2019.

1 infringement, it seems obvious that the filing of lawsuits is not “effective” in deterring
2 infringement.

3 17. The Lansky Declaration claims Strike 3 was formed in 2015. Prior to the
4 formation of Strike 3, Malibu Media, LLC filed nearly 3,300 complaints alleging copyright
5 infringement similar to the claims Strike 3 is making in this case. Mr. Lansky claims he was
6 involved in the industry for approximately nine years before forming Strike 3. His declaration
7 indicates that he was sufficiently familiar with the industry to conclude, “the industry and I were
8 not offering the best quality and experience possible.” As someone with nearly a decade of
9 experience in the industry, it would be reasonable to conclude that Mr. Lansky was aware of the
10 highly publicized Malibu Media cases and had an understanding of the pervasiveness of alleged
11 copyright infringement of pornographic works. It defies economic reasoning and common sense
12 that Mr. Lansky would form his business and—as he says in his declaration—“risk everything”
13 without a strategy to mitigate the costs of anticipated efforts to infringe on Strike 3’s works.

14 18. Forensic watermarking of content is a well-known and widely used technique to
15 identify individuals distributing infringing content and has been available prior to the formation
16 of Strike 3.² Trade publication Streaming Media notes: “Forensic watermarking allows content
17 owners and rights holders to identify pirated content online, then alert internet service providers,
18 who can then issue a warning to the infringing user or even shut off the user’s subscription.”³
19 Using such a service, Strike 3 can identify which of its subscribers is uploading infringing
20 content and take immediate action, such as cancelling the uploaders’ subscriptions to Strike 3’s
21 services.

22 19. Custos Media Technologies (RF) (Pty) Ltd. provides a service named “Screener
23 Copy.” The service adds a unique watermark and embeds a Bitcoin bounty to each video file

24 ² See, for example: Trabelsi, W. and M. H. Selmi. Multi-signature robust video watermarking. *2014 1st*
25 *International Conference on Advanced Technologies for Signal and Image Processing (ATSIP)*, pp. 158-163.
2014.

26 ³ Krefetz, N. Protecting your assets: How studios secure their premium video. *Streaming Media Magazine*.
27 September 28, 2018. <https://www.streamingmedia.com/Articles/Editorial/Featured-Articles/Protecting-Your-Assets-How-Studios-Secure-Their-Premium-Video--127701.aspx>, retrieved February 22, 2019.

distributed to users. The watermark and bounty make each copy identifiable and traceable. “Bounty hunters” on the Internet scan video files for the hidden Bitcoin bounties and, once found, claim it as a reward. Once the bounty is claimed, the copyright owner is notified of the leaked copy. Because the bounty is unique to each copy, the copyright owner can identify the source of the leak.⁴ Custos indicates it was designed to serve “smaller movie producers” and claims of 130,000 copies of material it has distributed, the service has “not had a single leak.”⁵ Based on information available at the time of this declaration, it is likely that Custos’ service or similar services would more effective and less costly than Strike 3’s litigation strategy.

20. Plaintiff’s actions in this suit, and others, is consistent with a theory that plaintiff is pursuing nuisance-value settlements, using the prospect of statutory damages and litigation expenses to extract quick settlements of low-probability-of-prevailing claims.

21. One of the earliest models of a sue-then-settle strategy finds that with low costs of filing a suit, plaintiffs can gather valuable information about the strength of their claim from a defendant’s response:⁶

A strategy such as [file suit, then go to trial if the defendant offers to settle, otherwise drop the action] may not at first seem to make much sense. Why does the plaintiff not grab the settlement when it is offered? Further reflection reveals that such a strategy may be quite appropriate where the defendant has information not available to the plaintiff. For instance, it might be that the defendant has chosen [to offer to settle if violator, otherwise do not offer to settle]. For the plaintiff then, the defendant’s offer to settle is an indication that the defendant did in fact violate the law, so that the plaintiff may prefer to increase his winnings by going to trial. On the other hand, the defendant’s refusal to offer to settle may be an indication that he did not violate the law, in which case the plaintiff would want to cut his losses. ...

Put differently, the plaintiff’s first strategy, (do not sue), is dominated by his fifth strategy, [file suit, then go to trial if the defendant offers to

⁴ Custos Media Technologies (RF) (Pty) Ltd. Custos Video: A simple one-click solution for filmmakers and videographers. 2017. <https://custotech.com/custos-video/>, retrieved February 22, 2019.

⁵ Lourie, G. This SA startup is fighting global problem of online piracy using Bitcoin blockchain. *TechFinancials*. June 21, 2018. <https://techfinancials.co.za/2018/06/21/this-sa-startup-is-fighting-global-problem-of-online-piracy-using-bitcoin-blockchain/>, retrieved February 22, 2019.

⁶ P’ng, I. P. L. (1983). Behavior in suit, settlement, and trial. *Bell Journal of Economics*, 14(2): 539–550.

1 settle, otherwise drop the action]. We conclude that the plaintiff will
2 always bring an action.

3 This surprising result is implied by the assumption that the plaintiff
4 incurs no legal costs by filing an action and then dropping it. Given the
5 assumption, the conclusion is quite intuitive: the plaintiff loses nothing
6 from filing suit.

7 22. Another early model of “nuisance suits” concludes that although a defendant
8 knows that the plaintiff will drop the case if the defendant responds, the defendant will still be
9 willing to pay a settlement amount of up to the cost of responding solely in order to avoid having
10 to make such a response.⁷

11 23. P’ng (1983) applies his sue-then-settle model to what he calls “frivolous suits:”

12 To some extent, this result accords with the folklore: a plaintiff brings
13 a frivolous action in the hope of extorting a settlement that is less than
14 the value of the defendant’s legal costs. The analysis also points to
15 another possibility: the defendant may be able to deter plaintiffs who
16 have filed actions from bringing these to trial by adopting a strategy of
17 refusing to settle, whatever his true type.

18 24. The economic rationale for damages is to make the Plaintiff “whole” and/or to
19 deny the liable party of the profits of from the wrongful act. Concepts of the efficient allocation
20 of resources conclude that laws, institutions, or arrangements that provide a windfall profit to
21 plaintiffs would result in a misallocation of resources. Legal scholars have implicitly
22 incorporated the economic approach in their attempts to define a copyright “troll.”⁸

23 A copyright troll is a plaintiff who seeks damages for infringement
24 upon a copyright it owns, not to be made whole, but rather as a primary
25 or supplemental revenue stream.

26 25. The following attempt to define “trolling” recognizes the process of searching or
27 prowling for potential revenues from litigation:⁹

The essence of trolling is that the plaintiff is more focused on the
business of litigation than on selling a product or service or licensing

⁷ Rosenberg, D. and S. Shavell (1985). A model in which suits are brought for their nuisance value. *International Review of Law and Economics*, 5(1): 3–13.

⁸ DeBriyn, J. (2012). Shedding light on copyright trolls: An analysis of mass copyright litigation in the age of statutory damages. *UCLA Entertainment Law Review*, 19(1): 79–112.

⁹ Sag, M. (2015). Copyright trolling: An empirical study. *Iowa Law Review*, 100(3): 1105–1147.

1 their IP to third parties to sell a product or a service. The paradigmatic
2 troll plays a numbers game in which it targets hundreds or thousands of
3 defendants, seeking quick settlements priced just low enough that it is
4 less expensive for the defendant to pay the troll rather than defend the
5 claim.

6 26. Greenberg (2015) identifies the role statutory damages may play in the
7 misallocation of resources for a copyright owner who “uses the prospect of statutory damages
8 and litigation expenses to extract quick settlements of often weak claims.”¹⁰

9 27. Commenting on the doctrine of copyright misuse, Judge Posner noted the
10 following: “hoping to force a settlement or even achieve an outright victory over an opponent
11 that may lack the resources or the legal sophistication to resist effectively, is an abuse of
12 process.”¹¹

13 28. Sag (2015) suggests that sue-then-settle actions are consistent with a theory that
14 plaintiffs are pursuing nuisance-value settlements.¹²

15 After obtaining the names and addresses of account holders suspected
16 of participating in a BitTorrent swarm, the plaintiff can get to work
17 negotiating settlements. An account holder accused of infringement is
18 almost invariably threatened with statutory damages and the prospect
19 of paying the plaintiff’s attorney’s fees if he is unable to establish his
20 innocence. Reports indicate that settlements are usually in the range of
21 \$2000 to \$4000. That is a lot to pay for a movie, but only a fraction of
22 the potential statutory damages for willful copyright infringement,
23 which can be as high as \$150,000 per work infringed. The \$4000 figure
24 is also evidently “a sum calculated to be just below the cost of a bare-
25 bones defense.” This does not prove that the plaintiffs are simply
26 pursuing nuisance-value settlements, but it is consistent with that
27 theory.

28 29. Consistent with Sag’s (2015) observations, I understand Strike 3 has accepted
29 offers of judgment of \$3,250, inclusive of damages, costs, and attorney fees.

30 a. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
31 76.172.87.57 (S.D.Cal.) 3:17-cv-02317-JAH-BLM.

32 ¹⁰ Greenberg, B. A. (2015). Copyright trolls and common law. *Iowa Law Review Bulletin*, vol. 100:77–86.

33 ¹¹ *Assessment Techs. of WI, LLC v. Wire Data, Inc.*, 350 F.3d 640 (2003).

34 ¹² Sag, M. (2015). Copyright trolling: An empirical study. *Iowa Law Review*, 100(3): 1105–1147.

b. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
 76.247.176.87 (N.D.Cal.) 5:17-cv-07058-EJD.

30. In a similar Strike 3 matter, the court concluded, “Strike 3 is a copyright troll,”
 and invoked much of the economic logic discussed above:¹³

Little wonder so many defendants settle. Indeed, the copyright troll's success rate comes not from the Copyright Act, but from the law of large numbers. According to PACER, over the past thirteen months, Strike 3 has filed 1849 cases just like this one in courts across the country—forty in this district alone—closely following the copyright trolls who together consumed 58% of the federal copyright docket in 2015. These serial litigants drop cases at the first sign of resistance, preying on low-hanging fruit and staying one step ahead of any coordinated defense. They don't seem to care about whether defendant actually did the infringing, or about developing the law. If a Billy Goat Gruff moves to confront a copyright troll in court, the troll cuts and runs back under its bridge. Perhaps the trolls fear a court disrupting their rinse-wash-and-repeat approach: file a deluge of complaints; ask the court to compel disclosure of the account holders; settle as many claims as possible; abandon the rest. [citations omitted]

31. Consistent with Judge Lamberth’s “Billy Goat Gruff” observation, I understand Strike 3 has dismissed all cases being heard by Judge Zilly, with the exception of this matter. I also understand that in the face of risking \$250 in sanctions for missing deadlines in the Eastern District of California, Strike 3 has terminated 24 cases.

a. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
 73.2.97.225, 1:18-cv-01075-MCE-CKD

b. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
 24.7.149.73, 1:18-cv-01076-MCE-CKD

c. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
 73.151.0.97, 1:18-cv-01080-MCE-CKD

d. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
 73.220.162.116, 1:18-cv-01089-MCE-CKD

¹³ *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address* 73.180.154.14. Memorandum Opinion. Civil Action #1:18-cv-01425-RCL (D.D.C). November 16, 2018.

- 1 e. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
2 73.151.0.180, 1:18-cv-01304-MCE-CKD
- 3 f. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
4 67.160.250.96, 2:18-cv-02640-MCE-CKD
- 5 g. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
6 73.70.116.109, 2:18-cv-02641-MCE-CKD
- 7 h. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
8 73.71.165.41, 2:18-cv-02642-MCE-CKD
- 9 i. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
10 98.208.93.240, 2:18-cv-02643-MCE-CKD
- 11 j. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
12 108.245.210.201, 2:18-cv-02584-MCE-CKD
- 13 k. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
14 162.237.197.54, 2:18-cv-02585-MCE-CKD
- 15 l. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
16 98.238.245.116, 2:18-cv-02636-MCE-CKD
- 17 m. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
18 24.10.96.207, 2:18-cv-02638-MCE-CKD
- 19 n. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
20 71.193.15.139, 2:18-cv-02639-MCE-CKD
- 21 o. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
22 73.41.142.236, 2:18-cv-02206-MCE-CKD
- 23 p. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
24 73.41.243.20, 2:18-cv-02207-MCE-CKD
- 25 q. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
26 73.41.91.169, 2:18-cv-02208-MCE-CKD
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1 r. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
 2 73.90.99.129, 2:18-cv-02209-MCE-CKD

3 s. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
 4 108.197.138.209, 2:18-cv-02582-MCE-CKD

5 t. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
 6 24.7.176.79, 2:18-cv-02201-MCE-CKD

7 u. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
 8 67.164.218.16, 2:18-cv-02202-MCE-CKD

9 v. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
 10 67.169.98.18, 2:18-cv-02203-MCE-CKD

11 w. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
 12 73.151.99.229, 2:18-cv-02204-MCE-CKD

13 x. *Strike 3 Holdings, LLC v. John Doe subscriber assigned IP address*
 14 73.192.163.54, 2:18-cv-02205-MCE-CKD

15 32. As an economist I routinely rely on the United States census data as a source of
 16 information. I find that census data to be reliable.

17 33. My understanding is that the subscriber in this case is located in zip code 980xx.
 18 According to the 2010 census data the average household size is 2.81 persons per household.
 19 <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF>. (See
 20 Exhibit 3).

21 34. Assuming each member of the household uses the internet, there is roughly a 36%
 22 chance of correctly naming the subscriber as alleged infringer. This does not account for the
 23 fact that IP addresses can be used outside of the householder or the router itself can be hacked.
 24 (See Exhibit 4).

1 I declare under penalty of perjury under the laws of the United States of America that
2 the foregoing is true and correct.

3 EXECUTED this 25th day of February, 2019, at Portland, Oregon.

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6 Eric Fruits, Ph.D.
7 Economics International
8 Portland, Oregon
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CERTIFICATE OF SERVICE

I, Adrienne D. McEntee, hereby certify that on February 25, 2019, I electronically filed the foregoing with the Clerk of the Court using the CM/ECF system which will send notification of such filing to the following:

Bryan J. Case, WSBA #41781
Email: bcase@foxrothschild.com
FOX ROTHSCHILD LLP
1001 Fourth Avenue, Suite 4500
Seattle, Washington 98154
Telephone: (206) 624-3600
Facsimile: (206) 389-1708

Lincoln D. Bandlow, *Admitted Pro Hac Vice*
Email: lbandlow@foxrothschild.com
FOX ROTHSCHILD LLP
10250 Constellation Blvd., Suite 900
Los Angeles California 90067
Telephone: (310) 598-4150
Facsimile: (310) 556-9828

Attorneys for Plaintiff

DATED this 25th day of February, 2019.

TERRELL MARSHALL LAW GROUP PLLC

By: /s/ Adrienne D. McEntee, WSBA #34061
Adrienne D. McEntee, WSBA 34061
Email: amcentee@terrellmarshall.com
936 North 34th Street, Suite 300
Seattle, Washington 98103-8869
Telephone: (206) 816-6603
Facsimile: (206) 319-5450

Attorneys for Defendant

— EXHIBIT 1 —

Eric Fruits, Ph.D.

Tel: 503-928-6635

www.econinternational.com

fruits@econinternational.com

Dr. Eric Fruits is an economics expert, finance expert, and statistics expert. He has produced numerous research studies involving economic analysis, financial modeling, and statistical analysis. As an expert witness, he has provided expert testimony in state courts, federal courts, and an international court.



As an economic damages expert, Dr. Fruits has provided expert testimony regarding business valuation, lost profits, and foregone income. He has been a testifying expert in cases involving real estate valuation, health care services, and transportation and shipping services. His research on the formation of cartels was published in the top-tier *Journal of Law & Economics*. His study of the impact of natural gas pipeline on residential property values has been published in the *Journal of Real Estate Research*, one of the premier academic journals in the field. He has provided expert testimony to state courts and federal courts.

As a finance expert, Dr. Fruits has been a testifying expert and provided expert consulting services in cases alleging insider trading and market manipulation. He is a securities expert who has conducted numerous research studies on financial issues, including initial public offerings and municipal bonds.

As a statistical expert, Dr. Fruits has provided expert testimony regarding real estate transactions, profit projections, agricultural commodities, and war crimes allegations. His expert testimony has been submitted to state courts, federal courts, and an international court.

He has written peer-reviewed articles on real estate markets, initial public offerings (IPOs), the municipal bond market, and the formation and operation of cartels.

Dr. Fruits has been affiliated with Portland State University, Pacific Northwest College of Art, University of Southern California, Indiana University, and the Claremont Colleges. He has been an economic consultant with Nathan Associates, LECG, ECONorthwest, and Econ One Research.

Present Positions & Affiliations

Economics International Corp. President and Chief Economist	2006–present
Cascade Policy Institute Vice President of Research	2019–present
International Center for Law & Economics Chief Economist	2017–present
Portland State University Oregon Association of Realtors Faculty Fellow Adjunct Professor in Economics, Business Administration, and Urban Studies & Planning <i>Center for Real Estate Quarterly Report</i> , Editor	2002–present

Previous Professional Experience

Nathan Associates Inc. Principal Consultant	2012–2018
Info Tech, Inc. Expert Consultant	2015–2018
Pacific Northwest College of Art Adjunct Professor	2009–2010
ECONorthwest Senior Economist	2002–2008
LECG, LLC Senior Economist	1999–2002
Claremont Graduate University Adjunct Professor of Economics and Visiting Scholar	1996–2002
Econ One Research, Inc. Economist	1998–1999
University of Southern California, Marshall School of Business Visiting Assistant Professor of Finance & Business Economics	1997–1998
Indiana University, Kelley School of Business Visiting Assistant Professor of Business Economics & Public Policy	1997
Scripps College Adjunct Professor of Economics	1996
Pomona College Lecturer in Economics	1994
Andersen Consulting Staff Consultant	1990–1991

Education

Ph.D., Economics, Claremont Graduate University	1997
M.A., Economics, Claremont Graduate University	1993
B.S. with Distinction, Business Economics & Public Policy, Indiana University	1990

Publications, Reports, and Other Papers

Academic Publications

Perceived environmental risk, media, and residential sales prices. *Journal of Real Estate Research*, with J. Freybote. 37(2):217–243. 2015.

Compact development and greenhouse gas emissions: A review of recent research. *Center for Real Estate Quarterly Journal*, 5(1):2–7. Winter 2011.

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Forecast of Oregon's economy in 2013: Disappointing but not disastrous. *Center for Real Estate Quarterly Journal*, 6(4):4–10. Fall 2012.

Right-to-Work and Economic Growth: A Comprehensive Analysis of the Economic Benefits to New Mexico of Enacting a Right-to-Work Law. Rio Grande Foundation. 2012.

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Fiscal Impacts of an Oregon Tax Credit Scholarship Program. Cascade Policy Institute. 2011.

The Oregon Health Plan: A "Bold Experiment" that Failed. Cascade Policy Institute. 2010.

Tax Policy and the Oregon Economy: The Effects of Measures 66 and 67. Cascade Policy Institute, with R. J. Pozdena. 2009.

Future Management of the Elliott State Forest: Providing Adequate Returns for Oregon Schools. Cascade Policy Institute. 2009.

Fiscal Impacts of Proposed Educational Tax Credits. Cascade Policy Institute. 2009.

Impact of Minimum Wage Indexing on Employment and Wages: Evidence from Oregon and Washington. Employment Policies Institute. 2009.

The Relationship Between Residential Development and Greenhouse Gas Emissions. National Association of Homebuilders. 2008.

Oregon Greenhouse Gas Reduction Policies: The Economic and Fiscal Impact Challenges. Cascade Policy Institute, with R. J. Pozdena. 2008.

The Ranking of Oregon State and Local Spending. Cascade Policy Institute, with R. J. Pozdena. 2008.

Damages: Experts, liability, and calculations. In *The Employment Case: From Discovery to Decision.* Oregon State Bar CLE Seminars. 2004.

How Does Oregon Spending Rank? Ideas for Budget Stability. Cascade Policy Institute, with R. J. Pozdena. 2004.

Letters, Op-Eds, and Columns

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City of Portland Livability Volunteer Award	2010
Institute for Humane Studies Research Grant	1996
John Randolph Haynes and Dora Haynes Foundation Grant	1995
Lynde and Harry Bradley Foundation Grant	1992–1995
Lionel Edie Award	1990

Courses Taught

Microeconomics
 Industrial Organization
 Economics of Regulation and Antitrust
 Urban Economics
 Managerial Economics
 Econometrics
 Real Estate Finance and Investment
 State and Local Public Finance
 Economics and the Creative Industries
 War Crimes

February 24, 2019

— **EXHIBIT 2** —



Identify | Manage | Monetize

The background of the slide is a dense, colorful collage of numerous small images. These images include a news anchor, a tiger, a child with a globe, a person at a computer, a city skyline, a globe with a magnifying glass, and various abstract and nature-themed pictures. The collage is set against a light blue background with a subtle grid pattern.

MANAGING PIRACY-SENSITIVE ASSETS ACROSS COMPLEX DISTRIBUTION WORKFLOWS

**A LOOK AT VERSATILITY AND SCALABILITY CHALLENGES
FOR ENTERPRISE-LEVEL FORENSIC MARKING SOLUTIONS**



NEXGUARD - PRE-RELEASE USE CASES | JAN 2013



TABLE OF CONTENT

Table of contents	2
Circulating content copies	3
Impact of potential piracy from copies in the field	3
MPAA recommendations.....	4
Workflow Challenges	5
Diversity of formats	5
Multi-site operations	5
Managing piracy-sensitive assets across decentralized distribution workflows.....	6
Deterrent against content theft.....	6
Efficient integration in distribution workflows.....	6
Multi-site and inter-organization operations.....	7
Forensic analysis in case of piracy.....	7
Advanced solution – NexGuard forensic watermarking solution for Pre-Release content	8
Digital watermarking technology for reliable serial numbering of content instances	8
Decentralized duplication and forensic marking system	9
A scalable and versatile solution.....	9
NexGuard - Pre-Release system-level elements.....	10
Integration to file-based digital workflows.....	10
a/ For serial numbering of multiple file instances in a given format.....	10
b/ For serial numbering of content instances upon transcoding to custom format per recipient.....	11
c/ For serial numbering per session upon H.264 streaming or file downloading	12
Integration to physical media duplication workflows	13
a/ For serial numbering of content on master tapes.....	13
b/ For serial numbering of video content as DVD screeners	13
Key benefits of NexGuard – Pre-Release solution	15
Deterrent against piracy	15
Enterprise-level system for decentralized operations.....	15
Versatile solution for multiple workflow types	15
Automated production operations	15
For more information.....	16
Contact	16
References	16
<i>Figure 1: Content circulation and risk of piracy</i>	<i>6</i>
<i>Figure 2: Imperceptible audio/video watermarking for forensic tracking</i>	<i>7</i>
<i>Figure 3: Video Watermarking principles for forensic marking applications.....</i>	<i>8</i>
<i>Figure 4: NexGuard - Pre-Release forensic watermarking solutions</i>	<i>9</i>
<i>Figure 5: NexGuard file embedder solution with watch-folders</i>	<i>11</i>
<i>Figure 6: NexGuard OMD solution for download or streaming.....</i>	<i>12</i>
<i>Figure 7: NexGuard Master solution for tape duplication</i>	<i>13</i>



The need for efficient duplication and distribution

Circulating content copies

During or post content production, a given piece of video content needs to be circulated throughout its lifecycle. A number of copies will therefore need to be distributed. These can include dailies for review and approval; preview proxies for screenings; master copies for VoD or TV airing; and repurposed versions for Internet and mobile portals.

Whether in-house or outsourced, duplication and circulation of content should be organized with rapid turn-around. The various content copies are distributed in a range of diverse formats, mostly as tapes, DVDs or digital files. In the specific case of content repurposing for Internet and mobile portals, each instance of the content might even have to be generated in a specific encoding format to meet the requirements of each individual content portal or distributor.

	Post-production	MarCom	Distribution	Repurposing
Content	Dailies, semi-finished content	Screeners for feature films and TV series	Preview proxies, Master copies	Live content, TV shows, TV episodic
Source	Production group	Marketing and communication group	Home entertainment group	Networks, TV stations, Broadcasters
Destination	Internal for review and approval	Journalists, Awards jury members	DVD replication plants, Broadcasters, VoD operators	Internet portals, Mobile portals

FACT #1: Release and monetization of content necessitate appropriate duplication and distribution of copies in a variety of formats.

NEED #1: A complete management-of-assets solution to track the dissemination of copies.

Content owners require accountability with regards to their assets. Solutions are needed wherever the location and whatever number of people involved are in the post-production, repurposing or distribution processes.

Impact of potential piracy from copies in the field

Content theft in professional environments is a major issue for Movie Studios and TV Content Producers. Pre-release content leakage may occur from preview and master copies circulated to broadcasters and VoD operators; screeners for the press and awards jury members; or repurposed TV programs for Internet and mobile portals.



The TV and film industries continue to heavily suffer from the illicit re-distribution of high-quality pirate copies, which are either sold as DVDs on the black market or circulated on cyberlockers and peer-to-peer web sharing sites.

The most impactful content theft is definitely the one occurring at the earliest stage of the content lifecycle. According to a survey by technologist Andy Baio [1], many blockbusters are illegally available online ahead of the Oscar season, sometime ahead of the theatrical release. Likewise, often episodes of TV series appear on the Internet prior to their first broadcast.

FACT #2: **Access to content and distribution of copies must be constrained to authorized recipients only.**

NEED #2: **A strong and reliable deterrent to counter the risk of potential content theft.**

Serial numbering of content – whatever its format – to identify copies one by one may be used by rights owners to answer three critical needs through a single process:

1. Tracking the dissemination of copies and organizing audits when needed
2. Introducing a strong deterrent against content theft and curbing piracy
3. Conducting forensic analysis in case of actual illicit circulation

MPAA recommendations

For more than three decades, the Motion Picture Association of America, Inc. (MPAA) has managed site security surveys on behalf of its member companies, namely the six top Hollywood studios. The MPAA has defined content security best practices organized according to the MPAA Content Security Model. MPAA recommends use of watermarking as part of digital security and content management, especially for entities that provide digital transfer services for any type of screener [2]:

"SCR-3.14: Apply invisible forensic watermarking to digitally streamed and/or downloaded screener content."

WORKFLOW CHALLENGES

Diversity of formats

Depending on the content format and on the purpose of a given instance, the audiovisual material may have to be delivered via:

- Tape or DVD-R duplication and shipment,
- Content formatting, possibly repurposing and transcoding, and file transfer or streaming.



For cost and efficiency reasons, most workflows tend to be digitized and based on files:

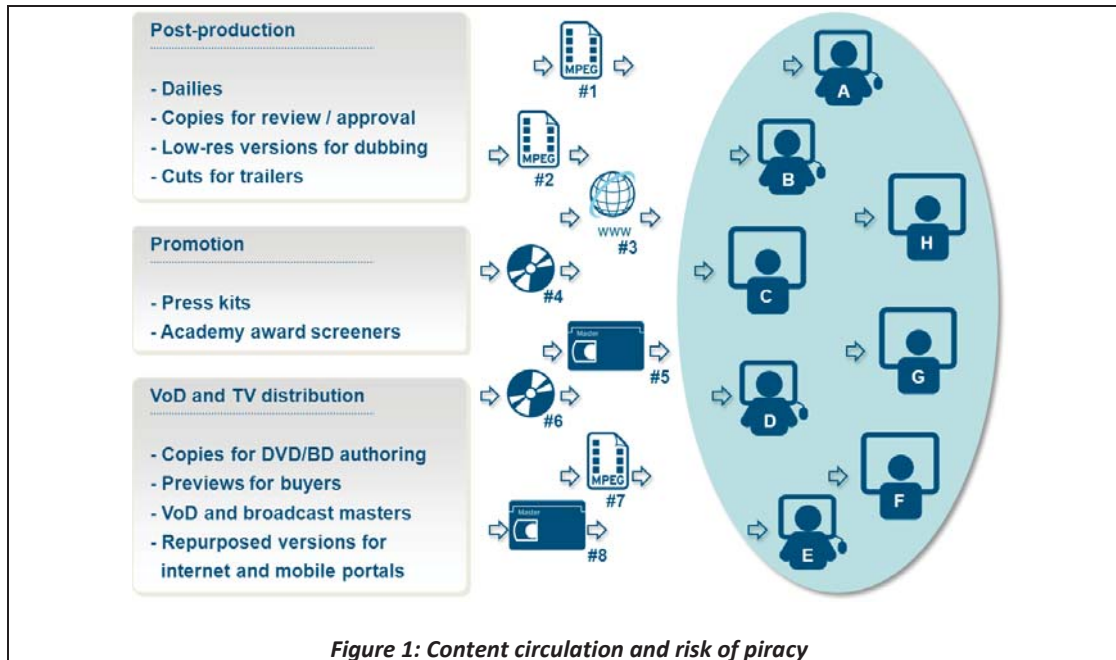
- Circulation of review and preview copies – respectively internal and to buyers – is commonly organized based on proxy file delivery or online streaming,
- Delivery of master tapes is being progressively replaced by transfer of mezzanine files,
- DVD-R duplication and shipment for screeners could be replaced by online screening,
- Content (re)formatting, possibly repurposing for different types of screens, is then delivered via file transfer to OTT VOD service providers.

File-based circulation of content relies on storage servers, transfer servers and content transcoding to deliver the expected formats. However, HD CAM SR tapes provide the utmost quality to deliver broadcast copies; and DVD is an easy way for occasional delivery to a large group of people and ensuring playability on regular computer and home-theater systems.

Multi-site operations

Movie studios or TV content producers usually work partly in-house and partly with contracted post-production facilities for content processing and delivery of content instances as tapes, DVDs or files.

Whether circulating content internally for review and approval, or externally for monetization, the challenge is to avoid having any genuine copy turn into a tidal wave of pirated versions. The risk of piracy arises from the broad circulation of content both internally and externally as illustrated in Figure 1 hereafter.



The successful circulation of content requires managing multiple recipients and diverse formats through efficient and secure workflows. The sheer number of teams involved in this process makes it challenging to get an exhaustive and clear view of produced copies in their respective source, format, and destination. For each and every situation, organized serial numbering of content is required; either as part of in-house operations or when outsourcing formatting and duplication to third-party post facilities.

MANAGING PIRACY-SENSITIVE ASSETS ACROSS DECENTRALIZED DISTRIBUTION WORKFLOWS

Deterrent against content theft

In order to enforce the liability of the individuals and/or organizations receiving an instance of a piece of content – or simply make those parties more aware of their responsibility – it is essential to introduce an efficient deterrent against content theft.

→ The content preparation and delivery solution should provide the content with and identity, i.e. insert imperceptible forensic marks, and – for certain copies – add a visible identifier such as the recipient's initials, logo or other unique personalization features.

Efficient integration in distribution workflows

Such content security should integrate seamlessly with existing streamlined processes. It should introduce minimal overhead into the respective workflows, from delivery of tapes or DVDs and to specific file formatting and transfer for Internet and mobile portals.



→ The forensic marking solution should be versatile and aggregate dedicated file, tape or DVD processing units along with combined transcoding/watermarking stations for any video file formats used in digital workflows.

Multi-site and inter-organization operations

Efficiently addressing the risk of content theft requires organizing a comprehensive and systematic process, including such cases as multi-site operations within an organization or inter-organization processes.

- The duplication and serial numbering system must be scalable and centralize content tracking information in a consolidated database in order to monitor the dissemination of assets.
- Several layers of watermark can be applied on the same piece of content.

Forensic analysis in case of piracy

The forensic mark may be used in case of actual content theft to facilitate investigations by identifying the source of the leak.

→ The forensic marking technology should provide robust identification and easy analysis of any video sample (eg. retrieved from user generated content (UGC) sites such as YouTube or Daily Motion).

The diagram hereafter illustrates how a serial numbering process based on imperceptible audio or video watermarking can help to identify the source of a leak. Watermark detection from any illicit copy allows investigators to ascertain which occurrence of the genuine content was illegitimately redistributed.

Forensic watermarking benefits include both a deterrent against content theft, and a means to support investigations in order to identify the source of the leak when piracy does occur.

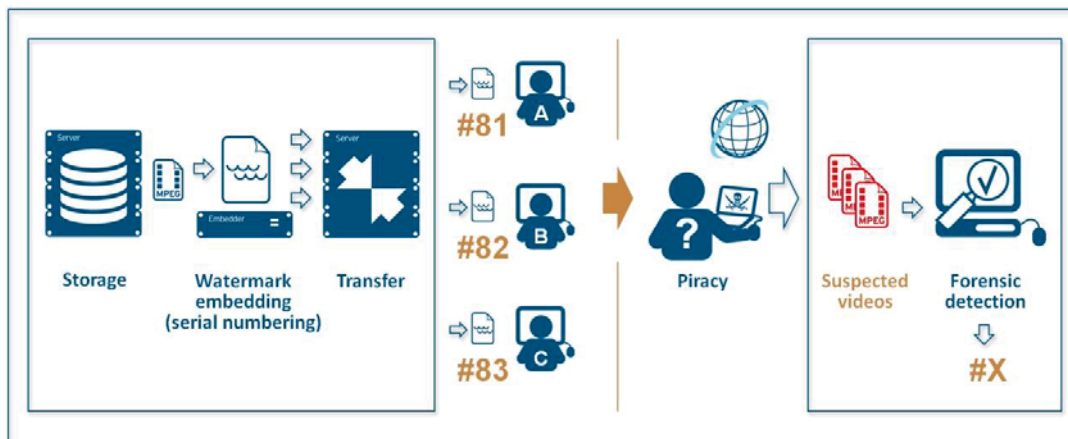


Figure 2: Imperceptible audio/video watermarking for forensic tracking



ADVANCED SOLUTION – NEXGUARD FORENSIC WATERMARKING

SOLUTION FOR PRE-RELEASE CONTENT

Digital watermarking technology for reliable serial numbering of content instances

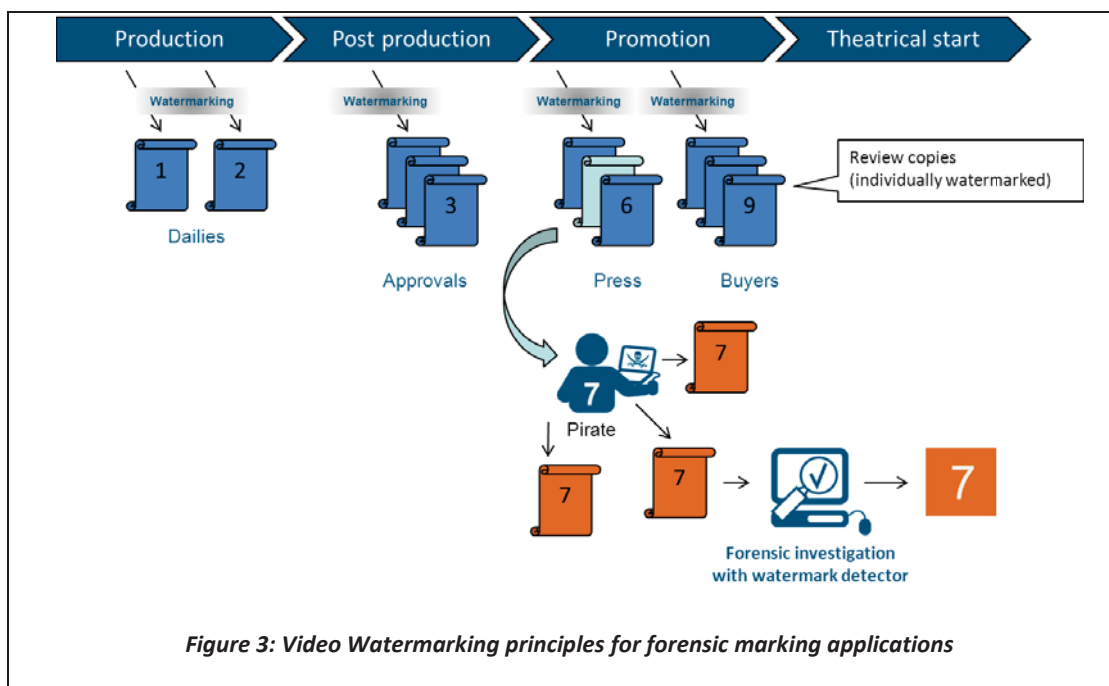
NexGuard® forensic watermarking solution for Pre-Release content ensures unique identification of each content copy as tape or DVD, or of each content instance as a file. It can combine inaudible audio watermarks and imperceptible video watermarks, as well as visible marking such as explicit warning messages or recipient initials.

The digital watermarks are robust to video format changes. The embedded watermark identifier represents a virtual serial number which can be recovered from collected video samples.



The use of digital watermarking technology enables the serial numbering of a given piece of content, regardless of its format, without hindering the viewer experience.

The main digital watermarking principles are depicted hereafter, in Figure 3



NexGuard forensic watermarking technology is also in operation in theaters equipped with digital cinema (d-cinema) systems and has been ported to set-top-box-type consumer devices used for pay-TV and premium VoD services.

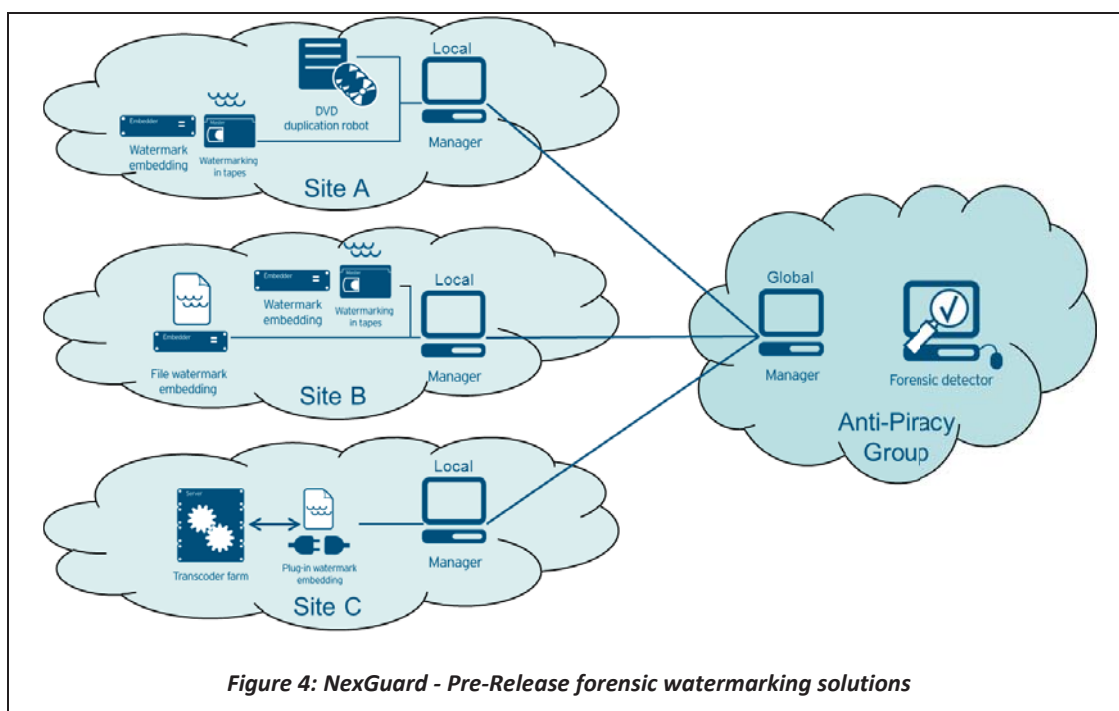


Decentralized duplication and forensic marking system

The NexGuard - Pre-Release leading-edge digital forensic watermarking system offers content owners and post-production facilities a scalable and versatile solution for various workflows, including content reviewing, master or screener delivery, or content monetization through repurposing of TV programs for online services.

The system relies on a central server, dedicated watermarking devices for watermark embedding in tapes, DVDs and files, and plug-ins for third-party transcoder stations. The content-tracking related information is consolidated in a global database for access (when necessary) by the anti-piracy group.

NexGuard components are available for all teams and process types of the global workflow as illustrated in Figure 3.



A scalable and versatile solution

The NexGuard - Pre-Release solution consists of Local Manager servers for regional operations, a Global Manager to centralize information in a single database, and a series of embedders or screener devices and/or third-party transcoder stations with watermarking plug-in.

The solution enables the seamless integration of content serial numbering in most distribution workflows and for:




- In-house and/or outsourced operations in one or several locations,
- Content distributed via file formatting and transfer/streaming,
- Content delivered after physical media duplication.



NexGuard - Pre-Release system-level elements

The NexGuard solution is designed from the ground up to organize a complete enterprise-level content distribution and tracking system. Tracking information includes each content copy and their respective virtual serial number as well as recipient details. The global database centralizes operation information from all facilities, including database abstracts from third-party facilities whenever duplication is delegated to external post-production entities.

Each system-level component of the NexGuard - Pre-Release forensic watermarking solution is further described in the below table.

<p>Local Manager product element</p>  <p>Manager</p>	<p>System-level server to operate the devices, configure tasks, automate operations, organize load balancing, monitor progress with a dashboard and query information from the SQL database.</p> <p>A single local manager can drive multiple devices in multiple locations. Its database logs every single operation from Screener and Embedder elements, and can be used to export activity reports.</p> <p>The system can be operated in three different ways:</p> <ul style="list-style-type: none"> i/ by operators using a web-based GUI, ii/ automated with pre-configured watch-folders, iii/ driven by a third-party application.
<p>Global Manager product element</p>  <p>Manager</p>	<p>Global system and inter-organization operations can consolidate information in a Global Manager database acting as a central information repository related to circulation of assets.</p> <p>For intra-organization operations, the Global Manager automatically collects information from the Local Manager servers in the various sites or regions.</p> <p>The Global Manager can also import data from third-party facilities to which some of the duplication tasks have been outsourced.</p>
<p>Detector product element</p>  <p>Forensic detector</p>	<p>Forensic analysis of a pirate video sample can be performed using the NexGuard Detector station or through on-line investigation-as-a-service.</p> <p>The watermark payload is a serial number or unique identifier of a given instance for a given content. Once the video analysis has unveiled the forensic mark, the person in charge of anti-piracy operations can query the Manager database to retrieve all the details related to this specific content copy, including details of the original intended recipient.</p>

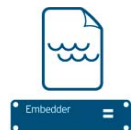
Integration to file-based digital workflows

a/ For serial numbering of multiple file instances in a given format

The NexGuard File Embedder is designed for fast watermark insertion in selected video file formats.

The solution ensures efficient operation when delivering content in a given format to multiple recipients.

File Embedder product element



File watermark
embedding

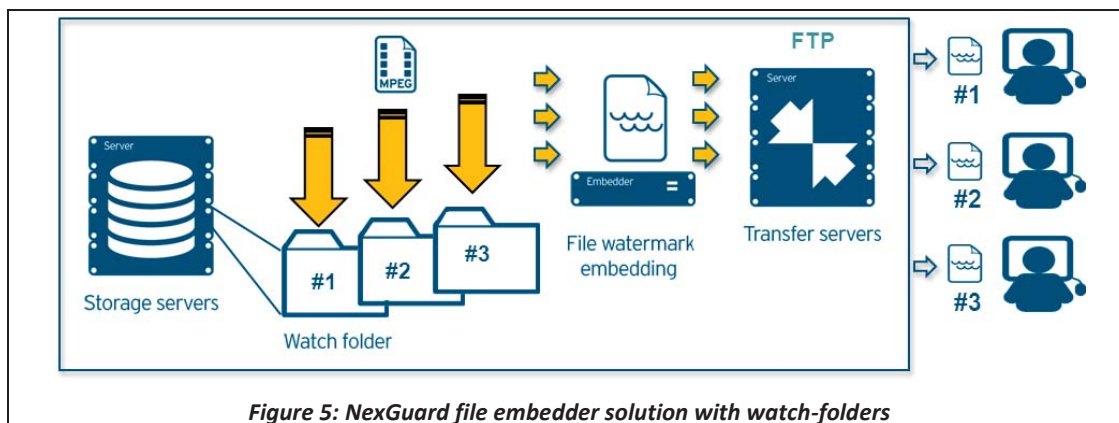
The Embedder product element offers high-speed file processing for most commonly used video formats such as MPEG-2 and WMV9.

The Embedder product element supports additional high-quality formats, including YUV (.avi), XD-CAM (.mxf), DPX Log (.dpx), ProRes 422 (.mov), MPEG2 Intra (.mpg), DV25 (.dv) files.

File processing can be defined by the operator on a per-job basis, and can be automated using pre-configured watch-folders, or driven by a third-party application on top of NexGuard Manager API.

The Figure 4 hereafter illustrates the specific case of watermarking by the NexGuard system of master and preview versions of a given piece of content. The operations are driven based on pre-defined watch folders. A watch folder is defined on a per recipient basis.

In this example, content is encoded once as an MPEG file and then delivered to multiple recipients, each receiving a uniquely watermarked copy. The NexGuard system can consecutively perform both the file watermarking and then file transfer based on secure FTP.




At the system level, the NexGuard Local Manager server may interface with various third-party media asset management (MAM) systems or workflow management solutions (please contact Civolution to obtain the updated list of integrated solutions).


b/ For serial numbering of content instances upon transcoding to custom format per recipient

Watermark embedding can be integrated as an image filter or audio filter during a content transcoding process. The NexGuard Embedder is then delivered as a watermarking plug-in for transcoder devices.

The solution ensures content watermarking whatever the source and destination file format.

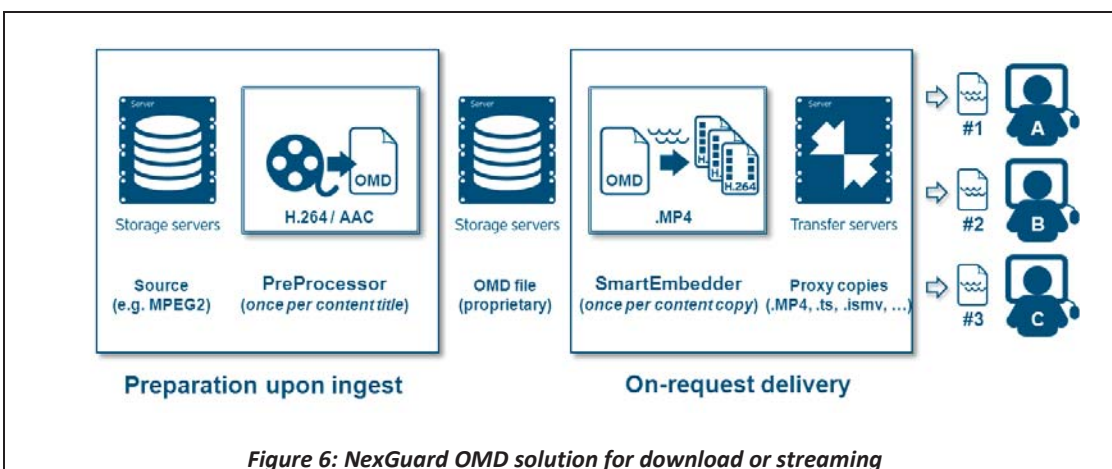
<p>Embedder transcoder plug-in</p>  <p>Plug-in watermark embedding</p>	<p>NexGuard Embedder software can be integrated as part of a transcoding station in order to perform transcoding and watermarking in a single pass and for any output format.</p> <p>Audio and video watermarking plug-ins are available. Both watermark types can be embedded in a given content.</p> <p>The plug-in can be interfaced with NexGuard Manager for recipient definition, allocation of a unique watermark identifier per copy, and logging of operations.</p>
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The NexGuard Embedder plug-in can be integrated into various third-party ingest, encoding and transcoding systems as listed in the table hereafter.

<p>Transcoding partners</p>  <p>Transcoder farm</p>	<p>Watermarking plug-ins can be made available for a variety of encoding and transcoding solutions including:</p> <ul style="list-style-type: none"> • iCR by AmberFin • Compressor (Final Cut Pro) by Apple (for ProRes 422 only) • StreamZ and Kayak by Digital Rapids • Elemental Server by Elemental Technologies • Grid Transcoding by RadiantGrid • Carbon Coder and Carbon Server by Rhomet / Harmonic • Agility (formerly Anystream) and Vantage by Telestream
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c/ For serial numbering per session upon H.264 streaming or file downloading

With the increasing use of smart devices connected to the Internet, on-line screening established itself as an alternative to the disk. The OMD¹ solution is designed to avoid decoding and re-encoding each individual stream or file delivered to the end user. The content is transcoded only once at the “Pre-Processing” stage and it is then watermarked on the fly through a “Smart Embedder” upon on-line delivery. The concept of the OMD solution is illustrated in the Figure 5 below.



¹ OMD stands for « On-line Media Delivery »



Integration to physical media duplication workflows

Content serial numbering based on digital watermarking technology can be organized upon duplication of physical media. Each duplication component – for DVDs or tapes – of the NexGuard Pre-Release forensic marking system is further described in the tables hereafter.

a/ For serial numbering of content on master tapes

Live Embedder product element



Master live embedding devices offer real-time processing of audio/video signal over SDI input/output interfaces, for use upon tape duplication or during ingest of content.

The solutions range from SD-SDI to dual-link HD-SDI for 444 RGB format as used on HDCAM SR video tape recorders (VTR).

The solution can encompass video watermarking as well a sophisticated visible marking for logo overlay and text keying.

The Figure 6 hereafter illustrates the watermark embedding upon tape duplication. It is possible to perform a QC detection of the watermark during quality control of the tape.

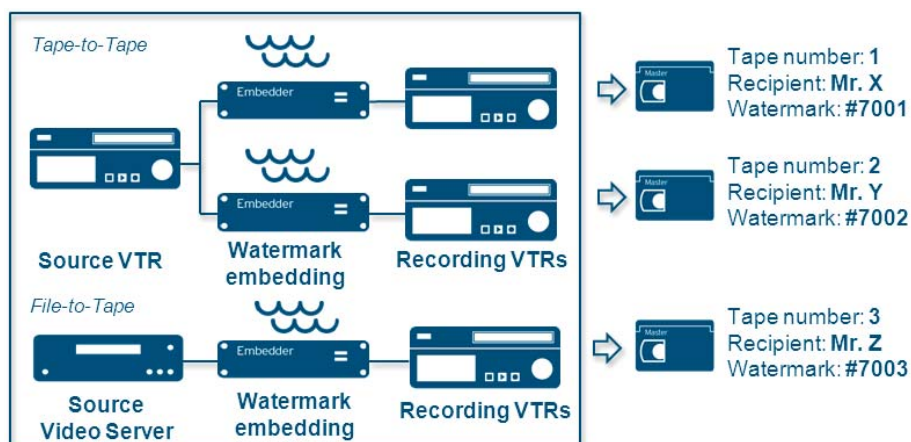


Figure 7: NexGuard Master solution for tape duplication

b/ For serial numbering of video content as DVD screeners

Screener product element



Watermarking
in DVDs


The Screener solution is a turnkey system which combines watermark embedding, DVD burning and label printing. The system is scalable and can typically produce 100 DVD5 copies in less than 5 hours.

The DVD content may also be protected against copying by using third-party anti-rip and controlled playback technology.

Video processing for individual copies can combine invisible watermarking and visible marking with either serial number or recipient initials as video overlay.



The NexGuard Screener component integrates with third-party duplication robot and anti-rip technology as listed in the table hereafter.

<p>DVD duplication partners</p>  <p>DVD duplication robot</p>	<p>The Screener solution is a turnkey system which interfaces with third-party DVD duplication robots:</p> <ul style="list-style-type: none">• 5400N, 5410N and 8100N by Rimage <p>The DVD content may also be protected using third-party technology:</p> <ul style="list-style-type: none">• Patronus anti-rip protection by Fortium• PIN-Play playback protection by Fortium
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The NexGuard Screener solution produces DVD5 or DVD9 type DVDs which can be played on a regular computer or home-theater system.



KEY BENEFITS OF NEXGUARD – PRE-RELEASE SOLUTION

NexGuard - Pre-Release forensic watermarking solution offers the critical benefits of organizing content copy identification, with minimum impact on operations, through a combination of leading-edge digital watermarking technology and workflow-driven system application.

Deterrent against piracy

The watermarking solution fulfills the following anti-piracy objectives:

- Unaltered viewer experience and identical playability on targeted devices,
- Compatible with further video processing (eg. use of DRM to secure file delivery),
- Survivability of the watermark in case of conversion, compression, etc.
- Blind watermark detection to identify the source of leakage in case of actual piracy.

Enterprise-level system for decentralized operations

The NexGuard - Pre-Release solution can be rolled out throughout an organization:

- Scalable multi-site multi-user system with web-based graphical user interface,
- Forensic marking system integrated to existing workflows,
- Consolidation of watermarking-related data into a global database,
- Aggregation of data from outsourced operations for inter-organization workflows.

Versatile solution for multiple workflow types

The processing elements for identifying individual content copies can handle all workflow situations:

- Duplication of tape or DVD media (e.g. masters and screeners),
- Copying and transfer of formatted files (e.g. dailies and preview proxies),
- Watermarking upon transcoding for delivery in a custom format for each recipient (e.g. repurposing for Internet portals).
- Watermarking upon on-line delivery with a unique identifier per session without the need to decode and re-encode each individual file or stream.

Automated production operations

The file-based digital workflows can be pre-defined:

- Standalone watermarking systems can be based on watch folder per recipient,
- Systems with watermarking upon transcoding can be based on watch folder per recipient and per format,
- Operations can be monitored with a control dashboard,
- Both audio and video tracks can be watermarked
- Combined systems (eg. transcoding, watermarking, transfer) can be supervised and driven by a third-party MAM or workflow management application.

The screener duplication can output ready-to-ship DVDs:

- Import or definition of the recipient list from the database,
- Automatic watermark embedding and initial overlay in the MPEG2 video,
- Printing of a label with recipient name or serial number on the DVD.



FOR MORE INFORMATION

Contact

Civolution NexGuard - Pre-Release forensic watermarking solutions are widely deployed and successfully used by movie studios, TV content producers and post-production facilities worldwide.

For more information please contact us: info@civolution.com

or visit our web site:

<http://www.civolution.com/applications/media-protection/nexguard-pre-release/>

Follow us on Twitter: [@Civolution](https://twitter.com/Civolution)

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[2]: MPAA

Best Practice re. Screener Digital Transfer Services – December 2011

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— EXHIBIT 3 —

DP-1

Profile of General Population and Housing Characteristics: 2010 2010 Demographic Profile Data

NOTE: For more information on confidentiality protection, nonsampling error, and definitions, see <http://www.census.gov/prod/cen2010/doc/dpsf.pdf>.

Geography: ZCTA5 980

1
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186
of
186

Subject	Number	Percent
SEX AND AGE		
Total population	39,816	100.0
Under 5 years	2,622	6.6
5 to 9 years	2,793	7.0
10 to 14 years	3,029	7.6
15 to 19 years	3,523	8.8
20 to 24 years	2,877	7.2
25 to 29 years	2,650	6.7
30 to 34 years	2,378	6.0
35 to 39 years	2,609	6.6
40 to 44 years	2,895	7.3
45 to 49 years	3,273	8.2
50 to 54 years	3,112	7.8
55 to 59 years	2,517	6.3
60 to 64 years	2,007	5.0
65 to 69 years	1,357	3.4
70 to 74 years	840	2.1
75 to 79 years	599	1.5
80 to 84 years	396	1.0
85 years and over	339	0.9
Median age (years)	35.1	(X)
16 years and over	30,744	77.2
18 years and over	29,361	73.7
21 years and over	27,199	68.3
62 years and over	4,674	11.7
65 years and over	3,531	8.9
Male population	19,756	49.6
Under 5 years	1,323	3.3
5 to 9 years	1,414	3.6
10 to 14 years	1,531	3.8
15 to 19 years	1,906	4.8
20 to 24 years	1,483	3.7
25 to 29 years	1,305	3.3
30 to 34 years	1,152	2.9
35 to 39 years	1,277	3.2
40 to 44 years	1,388	3.5
45 to 49 years	1,631	4.1
50 to 54 years	1,516	3.8
55 to 59 years	1,225	3.1
60 to 64 years	955	2.4
65 to 69 years	678	1.7
70 to 74 years	386	1.0
75 to 79 years	292	0.7
80 to 84 years	176	0.4
85 years and over	118	0.3

Subject	Number	Percent
Median age (years)	34.0	(X)
16 years and over	15,141	38.0
18 years and over	14,396	36.2
21 years and over	13,238	33.2
62 years and over	2,184	5.5
65 years and over	1,650	4.1
Female population	20,060	50.4
Under 5 years	1,299	3.3
5 to 9 years	1,379	3.5
10 to 14 years	1,498	3.8
15 to 19 years	1,617	4.1
20 to 24 years	1,394	3.5
25 to 29 years	1,345	3.4
30 to 34 years	1,226	3.1
35 to 39 years	1,332	3.3
40 to 44 years	1,507	3.8
45 to 49 years	1,642	4.1
50 to 54 years	1,596	4.0
55 to 59 years	1,292	3.2
60 to 64 years	1,052	2.6
65 to 69 years	679	1.7
70 to 74 years	454	1.1
75 to 79 years	307	0.8
80 to 84 years	220	0.6
85 years and over	221	0.6
Median age (years)	36.1	(X)
16 years and over	15,603	39.2
18 years and over	14,965	37.6
21 years and over	13,961	35.1
62 years and over	2,490	6.3
65 years and over	1,881	4.7
RACE		
Total population	39,816	100.0
One Race	37,848	95.1
White	28,858	72.5
Black or African American	1,568	3.9
American Indian and Alaska Native	1,637	4.1
Asian	4,074	10.2
Asian Indian	663	1.7
Chinese	560	1.4
Filipino	866	2.2
Japanese	252	0.6
Korean	687	1.7
Vietnamese	566	1.4
Other Asian [1]	480	1.2
Native Hawaiian and Other Pacific Islander	305	0.8
Native Hawaiian	78	0.2
Guamanian or Chamorro	44	0.1
Samoan	96	0.2
Other Pacific Islander [2]	87	0.2
Some Other Race	1,406	3.5
Two or More Races	1,968	4.9

Subject	Number	Percent
White; American Indian and Alaska Native [3]	356	0.9
White; Asian [3]	580	1.5
White; Black or African American [3]	314	0.8
White; Some Other Race [3]	146	0.4
Race alone or in combination with one or more other races: [4]		
White	30,497	76.6
Black or African American	2,145	5.4
American Indian and Alaska Native	2,210	5.6
Asian	4,939	12.4
Native Hawaiian and Other Pacific Islander	516	1.3
Some Other Race	1,682	4.2
HISPANIC OR LATINO		
Total population	39,816	100.0
Hispanic or Latino (of any race)	3,259	8.2
Mexican	2,467	6.2
Puerto Rican	122	0.3
Cuban	47	0.1
Other Hispanic or Latino [5]	623	1.6
Not Hispanic or Latino	36,557	91.8
HISPANIC OR LATINO AND RACE		
Total population	39,816	100.0
Hispanic or Latino	3,259	8.2
White alone	1,369	3.4
Black or African American alone	52	0.1
American Indian and Alaska Native alone	123	0.3
Asian alone	41	0.1
Native Hawaiian and Other Pacific Islander alone	9	0.0
Some Other Race alone	1,339	3.4
Two or More Races	326	0.8
Not Hispanic or Latino	36,557	91.8
White alone	27,489	69.0
Black or African American alone	1,516	3.8
American Indian and Alaska Native alone	1,514	3.8
Asian alone	4,033	10.1
Native Hawaiian and Other Pacific Islander alone	296	0.7
Some Other Race alone	67	0.2
Two or More Races	1,642	4.1
RELATIONSHIP		
Total population	39,816	100.0
In households	39,654	99.6
Householder	14,129	35.5
Spouse [6]	7,909	19.9
Child	12,350	31.0
Own child under 18 years	9,237	23.2
Other relatives	2,486	6.2
Under 18 years	890	2.2
65 years and over	365	0.9
Nonrelatives	2,780	7.0
Under 18 years	253	0.6
65 years and over	79	0.2
Unmarried partner	1,051	2.6
In group quarters	162	0.4
Institutionalized population	23	0.1

Subject	Number	Percent
Male	11	0.0
Female	12	0.0
Noninstitutionalized population	139	0.3
Male	66	0.2
Female	73	0.2
HOUSEHOLDS BY TYPE		
Total households	14,129	100.0
Family households (families) [7]	10,183	72.1
With own children under 18 years	4,850	34.3
Husband-wife family	7,909	56.0
With own children under 18 years	3,569	25.3
Male householder, no wife present	722	5.1
With own children under 18 years	356	2.5
Female householder, no husband present	1,552	11.0
With own children under 18 years	925	6.5
Nonfamily households [7]	3,946	27.9
Householder living alone	2,765	19.6
Male	1,239	8.8
65 years and over	190	1.3
Female	1,526	10.8
65 years and over	479	3.4
Households with individuals under 18 years	5,400	38.2
Households with individuals 65 years and over	2,543	18.0
Average household size	2.81	(X)
Average family size [7]	3.23	(X)
HOUSING OCCUPANCY		
Total housing units	14,935	100.0
Occupied housing units	14,129	94.6
Vacant housing units	806	5.4
For rent	242	1.6
Rented, not occupied	10	0.1
For sale only	270	1.8
Sold, not occupied	47	0.3
For seasonal, recreational, or occasional use	62	0.4
All other vacants	175	1.2
Homeowner vacancy rate (percent) [8]	2.6	(X)
Rental vacancy rate (percent) [9]	5.9	(X)
HOUSING TENURE		
Occupied housing units	14,129	100.0
Owner-occupied housing units	10,246	72.5
Population in owner-occupied housing units	29,424	(X)
Average household size of owner-occupied units	2.87	(X)
Renter-occupied housing units	3,883	27.5
Population in renter-occupied housing units	10,230	(X)
Average household size of renter-occupied units	2.63	(X)

X Not applicable.

[1] Other Asian alone, or two or more Asian categories.

[2] Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.

[3] One of the four most commonly reported multiple-race combinations nationwide in Census 2000.

[4] In combination with one or more of the other races listed. The six numbers may add to more than the total population, and the six percentages may add to more than 100 percent because individuals may report more than one race.

[5] This category is composed of people whose origins are from the Dominican Republic, Spain, and Spanish-speaking Central or South American countries. It also includes general origin responses such as "Latino" or "Hispanic."

[6] "Spouse" represents spouse of the householder. It does not reflect all spouses in a household. Responses of "same-sex spouse" were edited during processing to "unmarried partner."

[7] "Family households" consist of a householder and one or more other people related to the householder by birth, marriage, or adoption. They do not include same-sex married couples even if the marriage was performed in a state issuing marriage certificates for same-sex couples. Same-sex couple households are included in the family households category if there is at least one additional person related to the householder by birth or adoption. Same-sex couple households with no relatives of the householder present are tabulated in nonfamily households. "Nonfamily households" consist of people living alone and households which do not have any members related to the householder.

[8] The homeowner vacancy rate is the proportion of the homeowner inventory that is vacant "for sale." It is computed by dividing the total number of vacant units "for sale only" by the sum of owner-occupied units, vacant units that are "for sale only," and vacant units that have been sold but not yet occupied; and then multiplying by 100.

[9] The rental vacancy rate is the proportion of the rental inventory that is vacant "for rent." It is computed by dividing the total number of vacant units "for rent" by the sum of the renter-occupied units, vacant units that are "for rent," and vacant units that have been rented but not yet occupied; and then multiplying by 100.

Source: U.S. Census Bureau, 2010 Census.

— EXHIBIT 4 —

Your home Wi-Fi connection is vulnerable to hackers, cybersecurity researchers warn

By Jason Murdock On 9/5/18 at 6:10 AM

Millions of home Wi-Fi networks are currently at risk of being hacked, a British security company claimed on Wednesday. But not everyone is convinced it's an issue.

Weaknesses exist in how saved passwords in the browsers Google Chrome and Opera interact with Wi-Fi over unencrypted connections. That's according to SureCloud researcher Elliott Thompson, who discovered the alleged vulnerabilities and reported them earlier this year.

Thompson claimed that hackers could exploit the weaknesses to hijack a home's Wi-Fi, steal information from computers connected to the network and even implant malware.

"The hacker would be able to join the WiFi network, access shared files, access 'internet of things' devices which trust the local network [and] view what websites everyone is visiting," Thompson told *Newsweek*. "If those websites are unencrypted, the hacker could attempt to implant malware onto the device to steal passwords or access webcams from the computers on the network."

But there appear to be some major caveats to such an intrusion, however.

According to SureCloud, in order to compromise a home network, the cybercriminal would need to be within Wi-Fi range of the router. Additionally, the victim's device would need to be using the Chrome or Opera browsers that have the router's login credentials to an open network saved. If so, researchers said they could use software exploits to steal credentials in a minute.

And it also requires user interaction. In the proof-of-concept attack, the target would need to click a page pop-up that appeared to be their Wi-Fi router's admin menu for it to work.

SureCloud criticized the fact that Chrome browsers save Wi-Fi router administration credentials and re-enter them automatically—an auto-fill process that is designed for convenience. Obtaining router details could be used to capture the Wi-Fi network password (PSK), SureCloud said.

"Nearly every single home router that uses a web management page [would be impacted]," Thompson claimed. "There are likely hundreds of millions of routers fitting these criteria in use."

"The router is not the only requirement for exploitation," the security researcher conceded. "It is in combination with saved credentials, Chrome being in-use and the operating system remembering an open Wi-Fi network. These are all criteria that many people will meet."

A real-world problem?

But external independent cybersecurity expert Robert Pritchard told *Newsweek* he remained unconvinced the alleged issue reported by SureCloud was a problem at all.

"The vast majority of Wi-Fi networks these days are encrypted, meaning this attack would not be viable," Pritchard said. "Even if you can find an unencrypted Wi-Fi network, you would still have to find a victim on said network who is actively using Chrome or Opera, and who had the administrator credentials for the network router saved in the browser."

"Against unencrypted networks the attack hardly seems necessary—there is nothing to stop the attacker joining the network, intercepting traffic or doing any number of malicious things."

Responding, SureCloud researcher Thompson said: "The target device in the demonstration is connected to a secure, WPA2 protected network, then using the Karma attack the target is brought onto a fake unsecured network to begin the next stage of the attack."

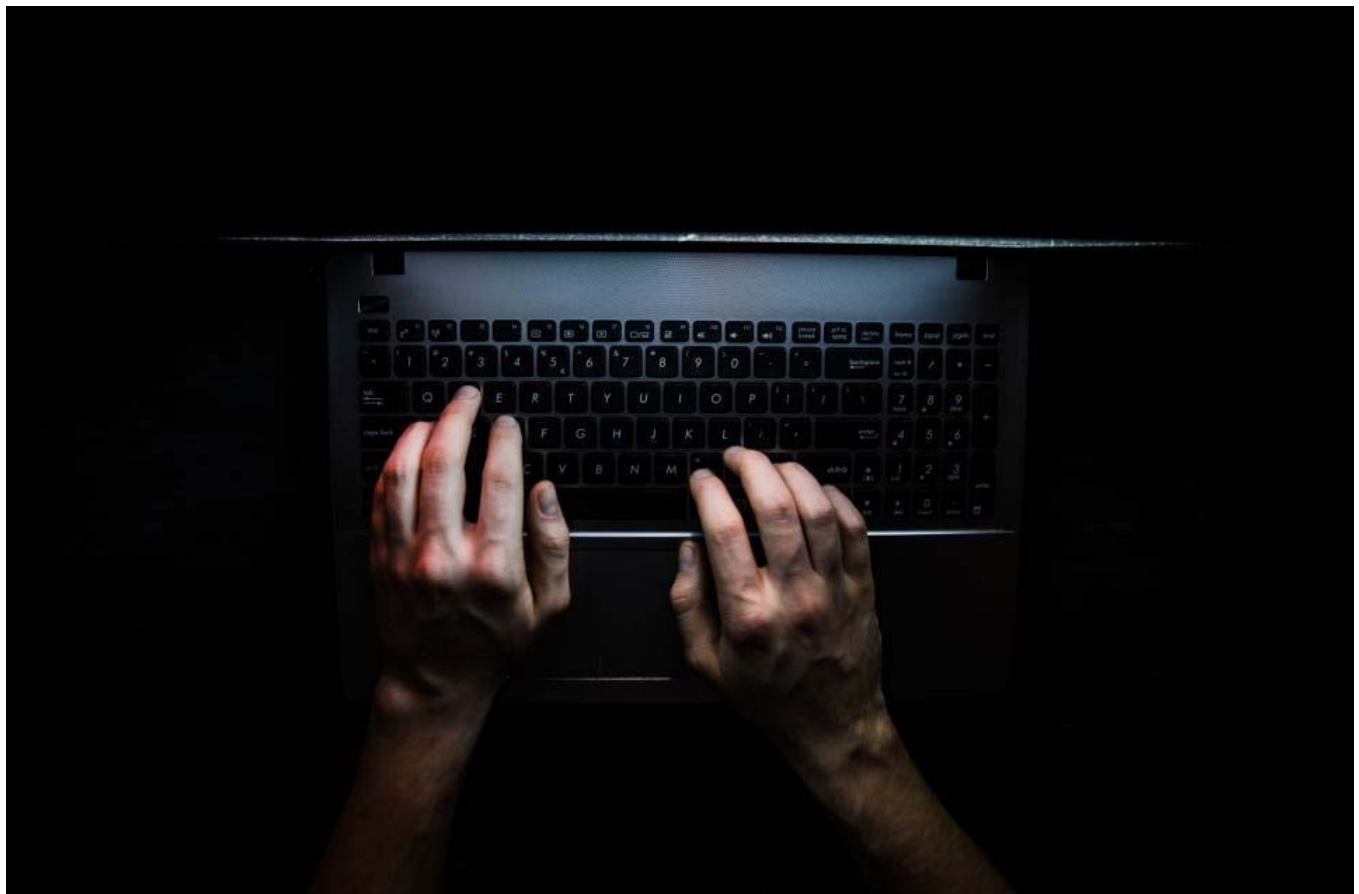
"The first Karma stage of this attack is well known, we have built upon that. The attack is demonstrated to work against WPA2 networks encrypted with a strong pre-shared key (PSK), this is what makes the finding significant. The attack doesn't require intercepting any traffic."

SureCloud said it disclosed its findings to Google's Chromium project on March 2, 2018. Chromium, which maintains the Chrome browser, said the password feature was "working as designed" and that it would not be updated in light of the alleged security weaknesses.

In a statement on Wednesday, Google told *Newsweek*: "Security is a core tenet of Chrome and we are committed to providing our users with a secure web experience."

"We appreciate the security community for working with us to bring any concerns to our attention. We'll study this closely and see if there are improvements to make."

Users can protect home networks by clearing their Chrome browser's saved passwords, deleting saved open networks and not allowing automatic reconnection to networks, SureCloud said.



"Nearly every single home router that uses a web management page [would be impacted]," Thompson claimed. iStock